PART II

SECTION 7 SANITARY SEWER GRAVITY COLLECTION SYSTEM

1. MATERIALS

Prior to fabrication or delivery, shop drawings for all materials to be used on the job shall be submitted to the City for review and approval.

A. Pipe and Fittings

- 1. Polyvinyl Chloride (PVC) Sanitary Sewer Pipe and Fittings:
 - a) The PVC C-900 pipe shall be push-on type, with bells, spigots and elastomeric gaskets, in accordance with AWWA C900 and AWWA C905, latest revisions. Nominal laid length of PVC C900, pipe shall be 20 feet. C900 PVC pipe shall be impregnated with green pigment and double labeled (180 degrees apart) with the following at intervals of not more than five (5) feet: Date of manufacture Manufacturer's Name & Record Code Nominal size "(CI)" "PVC" "Dimension Ratio (for example "DR25")" "AWWA pressure class (for example "PC100")—"AWWA designation number (ANSI/AWWA C900-97)".
 - b) SDR-35 Pipes: The PVC pipe shall be push-on type, with bells, spigots and elastomeric gaskets, in accordance with ASTM Standard D 3034, and in accordance with ASTM Standard D 3212, latest revisions. Joints using solvent cement will not be permitted. Nominal laid length of Type PSM SDR-35 PVC sewer pipe shall be 13 feet. Type PSM SDR-35 PVC sewer pipe shall be impregnated with green pigment and be double labeled (180 degrees apart) as follows at intervals of five (5) feet or less: Date of manufacture Manufacturer's name & Code Nominal size Cell classification "Type PSM SDR-35 PVC Sewer Pipe" "Specification D 3034"
- Ductile Iron Pipes (DIP): Ductile iron sanitary sewer pipe shall be minimum Class 53 for 6-inch, Class 52 for 8-inch through 15 inch sizes, conforming to latest revisions of ANSI/AWWA Standards C151/A21.51. All ductile iron pipes shall be lined internally with 40 mils Protecto 401 ceramic epoxy, or equivalent. All ductile iron pipes shall be push on rubber gasket jointed.
- 3. Fittings: shall match the material used for mains.
- 4. Service Lateral Connections shall be water tight and not protrude into the sewer main. A sanitary wye branch connection, 6 inch diameter or larger, shall be used to connect low density residential properties to the main. All other services shall use a minimum 8 inch diameter connection and shall tie through a new manhole at the main. A saddle type wye connection shall not be used. Vitrified Clay Pipe mains shall be lined or replaced prior to connecting a new service lateral to it. All materials used to make service connections shall be compatible with each other and with the pipe materials to be joined and shall be corrosion proof.

B. Pipe Joints and gaskets:

Elastomeric gasket joints providing a watertight seal shall conform to ASTM D3212 and F477, latest revisions. The gaskets shall be fabricated from a high-grade elastomer compound in accordance with ASTM Standard F477, "Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe, except as otherwise modified herein. The basic polymer for the gaskets shall be synthetic rubber. Natural rubber gaskets or gaskets with both natural and synthetic rubbers wilt not are permitted. Gaskets shall be continuous, elastomeric, rubber ring type.

C. Manholes:

- 1. New manholes shall be precast. Cast-in-place concrete or brick masonry manholes may be used only if approved by the City Engineer. Precast manholes shall conform to ASTM C478, with Type II acid resistant cement. All manholes shall have 48" minimum inside diameter and shall have monolithically poured base.
- 2. Concrete in precast manholes shall maintain a minimum compressive strength of 4000 psi in 28 days, and all reinforcing bars shall be ASTM A615 grade 60 steel with minimum of 3 inches cover.
- 3. Manhole built-in sections shall be joined with a mastic compound or a round compression ring of neoprene material set in annular spaces cast into the spigot end of a bell and spigot type joint. The mastic compound or ring shall be uniformly compressed between the positioned sections so as to form a watertight joint. After the sections are assembled, the remaining space in the joint shall be pointed up and filled with dense cement mortar and finished so as to make a smooth, continuous surface inside and outside the wall sections.
- 4. Shallow manholes may have an eight inch (8") precast reinforced concrete slab on the top in-lieu of the conical sections. Slabs shall have a twenty-four inch (24") minimum diameter access hole centered in the slab.
- 5. Precast manhole cones or slabs shall terminate at such elevations as will permit laying up a minimum of three (3) courses and maximum of (5) courses of clay brick under the manhole frame to make allowance for future street adjustment and/or settlement.

D. Brick for Manholes:

Bricks for manhole construction shall be dense, hard burned, common clay brick conforming to ASTM Standard C62, "Building Brick (Solid Masonry Units made from Clay or Shale)". All bricks shall have true edges and sharp corners and shall have been cured for at least 14 days before being placed.

E. Manhole covers:

Manhole covers shall be cast iron and have a roadway or pedestrian type surface as required by location and shall have "Sanitary Sewer" and "City of Miami Beach" in Futura font and Logo cast into them. Material used in the manufacture of the castings shall conform to ASTM A48, "Gray Iron Castings" for Class 30 iron. All lids shall be provided with an HDPE watertight manhole insert, as manufactured by Southwestern Packing & Seals, "Rainstopper", or approved equal, to reduce stormwater inflow.

F. Manhole Couplings for PVC pipes:

Shall conform to the requirements for the PVC pipe and shall be completely coated on the exterior with fine aggregate bonded into the PVC surface.

G. Cleanouts:

Commercially manufactured wye branches and fittings shall be used to connect to the sewer main. Cleanouts on house laterals shall be located in the right-of-way as close as possible to the property being serviced. A City approved box and cover, according to City Standard Details, shall be used over the cleanout. The top of the cleanouts shall be a maximum of 6 inches below finish grade and have a threaded brass plug with a protruding integrally cast square nut. Plugs with recessed holes for tool grips shall not be used.

H. Miscellaneous Material:

- 1. PVC double bell repair couplings, with no stop sleeves, matching the type of pipe used.
- 2. PVC double bell transition couplings or adapters for SDR 35 PVC Sewer Pipe to Ductile Iron or AVWVA C900 CI PVC Pressure pipe connectors.
- 3. Stainless steel repair clamps, with stainless steel bolts and nuts.
- 4. Fernco type adapters with stainless steel fixtures.

2. INSTALLATION

- A. Proper and suitable tools and equipment for the safe and convenient handling and laying of pipe shall be used, conforming to manufacturer's recommendations. At the time of lying, the pipe shall be examined carefully for defects, and should any pipe discovered to be defective after being laid, it shall be removed and replaced with sound pipe by the Contractor at his expense.
- B. Excavation and backfill for trenches and manholes shall be specified in the Sitework Excavation and Backfill for Utilities and Structures Section, of the CMB Public Works Manual.
- C. Where location of sewer is not clearly defined, install the sewer so it shall not be closer than 6 feet horizontally, pipe face to face (10 ft. preferable) with a water supply main or service line. When the bottom of the water pipe will be at least 18 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet separation, pipe face to pipe face (see section (IV)(A) (4) for pipe material to be used).
- D. Trench widths in stable soils shall provide a 12-inch maximum clearance on each side, between the outside of the pipe barrel and the face of the excavation, or sheeting if used, when measured to a point 12 inches above the top of the pipe. Minimum trench widths under the same conditions shall be minimum 6-inches on each side. Minimum trench widths are required to provide room for a man to place and compact the haunches and initial backfill material. In unstable soils (defined as peat, mulch or other organic soils, elastic silts and clay or fine sands below the water table), trench widths shall be a minimum of five (5) nominal pipe diameters in width when measured at a point 12-inches above the top of the pipe to

accommodate trenching and compacting equipment and requirements.

- E. Bedding and initial backfill 6 inches below and 12 inches above sewer mains and services shall be coarse sand with no rocks larger than ³/₄ inch diameter.
- F. Shape the bottom of the trench by hand to give substantially uniform circumferential support to the bottom of each pipe. When applicable, pipe laying shall proceed upslope with the spigot ends pointing in the direction of the flow.
- G. The pipe shall be laid in the prepared trench, true to line and grade. The pipe barrel shall receive continuous, uniform support with no pressure being exerted on the pipe joints from the trench bottom.
- H. A "Green" plastic detector tape with metallic foil and with the words "CAUTION SEWER LINE BURIED BELOW" printed at 30" intervals along the tape, shall be placed 18" above all sewer mains and laterals.
- I. Each pipe to be laid true to line and grade as indicated on the drawings and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line. The pipe shall be laid so that the identification markings are located on the top of the installed pipelines The Contractor shall use surveying instruments to maintain alignment and grade. At least one elevation shot shall be taken on every pipe joint.
- J. The interior of the sewer pipes shall be kept clean and free of all dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the joining is completed. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe. Adequate support shall be provided in this case to retain pipe in place against uplift due to water in trench. Any pipe found defective shall be immediately removed and replaced with sound pipe.
- K. Sewer pipes shall be installed in accordance with latest revision of ASTM D2321 and the Uni-Bell Plastic Pipe Association's "Recommended Practice for the Installation of PVC Sewer Pipe".
- L. Manholes shall be constructed as indicated on drawings in accordance with the City of Miami Beach Standard Details. Manhole pipe openings are to be sealed with elastomeric grout or approved equal. No molding plaster will be allowed.
- M. The invert channels shall be formed of brick or brick rubble thoroughly bedded and covered with sand-cement grout, accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practical.
- N. After the manholes have been installed and inspected by the City for cracks and defects, two (2) coats (a minimum thickness of 8 mils each dry of protective material, Kopper's 300M or equal) shall be applied to the inside surface of the manhole at the job site. This material shall

be applied in accordance with the manufacturer's specifications and cover all voids. The coats shall have contrasting colors so as to be easily verified.

O. Manhole to sewer main connections:

- 1. PVC sewers: The first joint at both influent and effluent sewers at each manhole, including service laterals, shall consist of an approved manhole coupling grouted into the manhole wall, and providing a continuous watertight elastomeric gasket seal between the coupling and the pipe inserted therein. The coupling shall have an increasing tapered interior from the gasket groove to allow flexibility for the pipe in the event of future settlement of the manhole or pipeline. The first length of PVC pipe into or out of the manhole shall be two (2) feet long, maximum, and shall be either plain-end by plain-end, or plain-end by bell. In the first option, the next joint shall be a double bell PVC repair coupling (no stop) with a maximum one (1) inch gap between the pipes inserted therein. In the latter option, the next joint shall be another two (2) feet long section maximum, of plain-end by bell PVC pipe.
- 2. Ductile Iron Pipes: The first length of pipe into or out of the manhole shall be a 2-foot length of plain end by plain end ductile iron pipe (i.e. two (2) feet, as measured from the outside wall) grouted directly into the opening in the manhole wall. This Plain End to Plain End short sleeve shall be joined to the spigot end of an adjacent ductile iron or to the Vitrified Clay Pipe with a Fernco Adapter.
- Vitrified Clay Pipes (VCP): shall be removed and replaced with either PVC or DI
 pipe. New pipes are to be connected to the existing VCP by appropriate Fernco
 adapters.
- 4. Where a service lateral enters a manhole at an elevation of two (2) feet or less, an internal drop shall be provided. For drops over two (2) feet above the sewer main invert, a drop connection on the exterior, with a cleanout extension into the manhole shall be provided. No brick manholes are allowed with outside drops.
- P. Frames and Covers: Cast iron frames and covers shall be set in a bed of mortar and carefully adjusted to elevation shown on the drawings. A minimum of 3 and maximum of 5 courses of brick shall be provided under frames for adjusting manhole cover elevations. Interior shall be sealed as specified above for the manholes.

3. TESTING AND INSPECTION

- A. The Contractor and Engineer shall inspect all installed sewer lines by visually checking each section for alignment prior to placing into service. A full circle of light shall be seen by looking through the pipe at a light held at the opposite end of the section of sewer line being inspected. The Contractor shall make any corrections required in line or grade.
- B. The City's Inspector must be notified in writing at least 24-hours prior to all scheduled formal tests.
- C. Leakage Tests:

- 1. Prior to testing for leakage, the trench shall be completely backfilled and compacted properly. Test shall be performed just prior to final paving over trench.
- 2. Test lines for leakage by exfiltration tests. In areas where pipe is laid below groundwater level, assure that there is no infiltration prior to performing the exfiltration tests.
- 3. Visible leaks into the system shall be corrected regardless of the amount of leakage.
- 4. The infiltration test procedure shall be used when the water table is 2 feet or more above the top of the pipe at the upper end of the pipe line section to be tested. Infiltration shall be measured using a suitable weir or other acceptable device.
- 5. An exfiltration test shall be performed, when an infiltration test cannot be properly performed.
- 6. The exfiltration test procedure shall be performed by filling the manhole, line and laterals with clean water. The filled lines shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24 hours; no additional allowance will be made for service laterals. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and system retested. Correction and retesting shall be made at Contractor's expense.
- 7. Manhole exfiltration leakage shall not exceed 4 gallons per day per manhole tested.
- 8. After all testing and paving has been completed, the sanitary sewer system shall be televised, at Contractor/Developer's expense. Digital copy of the sewer line video on acceptable form of media and inspection report shall be reviewed by the City Engineer or his designee. Contractor shall be responsible for correcting any deficiencies noted prior to the Engineer of Record's certification of completion of the work to any agency.

4. SPECIAL CONSIDERATIONS

A. . Design criteria:

- 1. Minimum slopes: Gravity sewer mains shall be designed and constructed to achieve scouring velocities, when flowing full, of not less than 2.0 feet per second, based on Manning's formula using an "n" value of 0.013.
- 2. Minimum pipe sizes: Gravity sewer mains shall be minimum 8 inches in diameter. Laterals shall be minimum 6 inches in diameter for single family residential properties; and minimum 8 inches in diameter for multi-family and non-residential properties and are to be connected to the main through a manhole.
- 3. Manholes shall be installed at the end of each line; at all changes in grade, size or alignment; at all intersections of mains; and with line distances of not greater than 400 feet

between manholes

- 4. Where gravity sewers mains cross above waterlines, the sewer pipe for a distance of 6 feet (pipe to pipe separation) on each side of the crossing shall be DIP or PVC C900/C905, with no joint closer horizontally than 3 feet to the crossing (pipe to pipe separation).
- 5. The following pipe materials shall be used based on vertical depth of cover and locations, unless shown otherwise required by calculations due to special loading or other conditions:
 - a) Unpaved swale area: COVER < 30"-36": Use PVC C-900 or Ductile Iron Pipe. COVER > 3 feet: SDR 35 or C-900
 - b) Paved areas: COVER < 30"-36": Use PVC C-900 or Ductile Iron Pipe with concrete slab over it, as per Standard Detail. COVER > 3 feet: Use PVC C-900 or Ductile Iron Pipe.
- B. The Contractor shall be in compliance with all applicable provisions of the Occupational Safety and Health Act of 1970, in general, and any subsequent amendments and revisions thereto and specifically to the provisions concerning confined space entry and the Trench Safety Act. The costs of compliance shall be included as part of the unit cost of pipe installation.
- C. The Contractor shall be responsible for providing an approved maintenance of traffic (M.O.T.) plan and shall conduct his operations in such a manner, utilizing warning devices such as traffic cones, barricades and warning lights, and personnel such as flagmen and uniformed police officers, the contractor shall ensure that the public is given adequate warning of hazards of the work site as may be deemed necessary by the City Engineer. In the instance of men working within the manholes, the Contractor shall provide safety provisions to cover any possible of structural failure and/or flooding. Such provisions might include but not be limited to, ladders in position to permit rapid egress; safety harnesses; stand by pumping equipment; extra air supplies; and such other measures as the situation and good construction practices might indicate.
- D. Riser rings will not be allowed to adjust manholes to final grade, unless specifically approved by the City Engineer.

E. Sewer Bypass Pumping:

- Sanitary sewer flows shall be controlled through the section of pipeline and pump stations where work is being performed. Under no circumstances, can portions of the system be removed from service for periods of time in excess of that approved by the City's Public Works Department.
- The Contractor shall be responsible to assess conditions and capacities of the existing sewer lines and pump stations, in coordination with City of Miami Beach Public Works Department, and accommodate the flows in the project work-plan in order to implement an acceptable bypass pumping plan at no additional cost to the City.
- 3. Bypass pumping will be required for all sewers and pump station reconstruction that would result in shutdown of existing facilities. The Contractor shall supply the necessary pumps, conduits, and other equipment to not only divert flow around the pump station, manhole or section of pipe in which work is to be performed, but also to transmit the flow in downstream sewer lines and/or pump stations without surcharge.
- 4. The bypass systems shall be of sufficient capacity to handle existing flows plus additional flows that may occur during periods of high tide or rainfall. In addition to the

primary bypass pumping system emergency backup pumping capability, such as a Vacuum Truck with minimum capacity of 1000 gallons, must be available within one (1) hour in case of emergency.

- 5. The Contractor shall be responsible for furnishing the necessary labor, power, and supervision to set up and operate the pumping and bypass systems.
- 6. When pumping is in operation, all pump engines shall be equipped in a manner to keep the pump noise to a minimum in order to comply with the City noise ordinances.
- Contractor shall have personnel present at all times during sanitary sewers by passing operation. By-passing in the roads or within pedestrian traffic areas shall not result or pose a hazard to pedestrians or traffic.
- 8. Contractor shall provide an approved maintenance of traffic (M.O.T.) plan and obtain all required right-of-way and regulatory permits prior to commencing any work.

F. As Builts:

Prior to final acceptance, 2 copies of as-built drawings certified by a Florida Registered Land Surveyor and Mapper (PSM) shall be provided to the City for approval and acceptance of the sewer mains, manholes, laterals and cleanouts, together with a copy of the digital media producing such As-Builts. The As-Built drawings must show Station numbers and horizontal offsets from the Base Line and Right-of-Way lines on a plan scaled at not less than 1"=50 ft. for all manholes, wyes, laterals cleanouts etc. in horizontal alignment, and a profile with a vertical scale of not less than 1" = 2 ft. with invert elevations at all manholes, wyes and at approximately every 50 ft. at a minimum. As-Built Plans and Profiles must also show all abandoned and plugged sewer pipes and laterals within the project limits.